

January 1994



Biology 30
Grade 12 Diploma Examination

Copyright 1994, the Crown in Right of Alberta, as represented by the Minister of Education, Alberta Education, Student Evaluation Branch, 11160 Jasper Avenue, Edmonton, Alberta, T5K 0L2. All rights reserved. Additional copies may be purchased from the Learning Resources Distributing Centre.

Special permission is granted to **Alberta educators only** to reproduce, for educational purposes and on a nonprofit basis, parts of this examination that do **not** contain excerpted material **only after the administration of this examination**.

Excerpted material in this examination **shall not** be reproduced without the written permission of the original publisher (see credits page, where applicable).

January 1994

Biology 30

Grade 12 Diploma Examination

Description

Time allotted: 2.5 h. You may take an additional 0.5 h to complete the examination if needed.

Total possible marks: 100

This is a **closed-book** examination consisting of **two** parts:

Part A

has 70 multiple-choice questions each with a value of one mark.

Part B

has 4 written-response questions for a total of 30 marks.

Instructions

- Fill in the information required on the answer sheet and the examination booklet as directed by the presiding examiner.
- Carefully read the instructions for each part before proceeding.
- The presiding examiner will collect your answer sheet and examination booklet and send them to Alberta Education.
- Do not fold the answer sheet.

Note: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.



Digitized by the Internet Archive
in 2016

Part A: Multiple Choice

70 Questions

Instructions

- Read each question carefully and decide which of the choices **best** completes the statement or answers the question.
- Locate that question number on the separate answer sheet provided and fill in the circle that corresponds to your choice.

Example

This diploma examination is for the subject of

- A. biology
- B. physics
- C. chemistry
- D. mathematics

Answer Sheet

● (B) (C) (D)

- Use an **HB pencil only**.
- If you wish to change an answer, erase **all** traces of your first answer.

Note: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.

Do not turn the page to start the examination until told to do so by the presiding examiner.

Part A: Multiple Choice

30 Questions

Instructions

• Select the best answer for each question.
• Write the letter of the correct answer in the space provided.

• Each question has one or more correct answers.
• Write the letter of the correct answer in the space provided.

Example

Which of the following is a function of the cell membrane?

- to store energy
- to protect the cell
- to control the movement of substances in and out of the cell
- to provide structural support

Answer: C

1. The cell membrane is a phospholipid bilayer.

2. The cell membrane is a barrier between the cell and its environment.

3. The cell membrane is a barrier between the cell and its environment.

4. The cell membrane is a barrier between the cell and its environment.

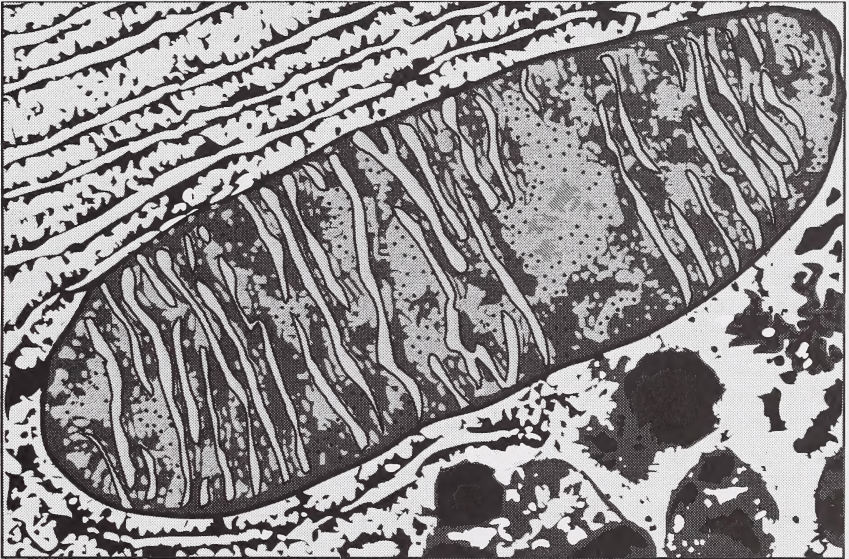
5. The cell membrane is a barrier between the cell and its environment.

1. Which cellular structure is **not** composed of membranes?

- A. Chromosome
- B. Golgi complex
- C. Mitochondrion
- D. Endoplasmic reticulum

Use the following picture to answer question 2.

A Cell Organelle



2. The organelle shown in the picture functions directly in the

- A. storage of food, water, and other materials
- B. digestion of materials within the cell
- C. control of all cell functions
- D. production of ATP

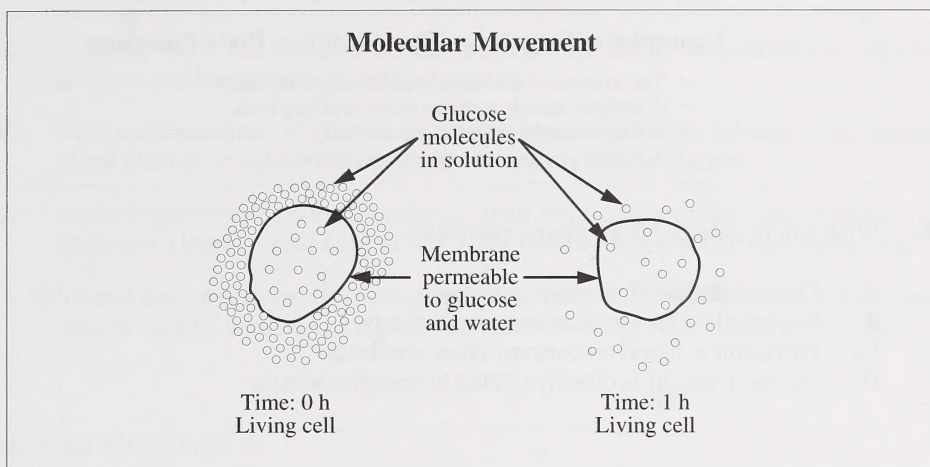
Use the following information to answer question 3.

Some Functions of Cell Membranes

1. The phospholipid layer of cell membranes prevents the passage of water and water-soluble substances through the membranes.
2. Water and water-soluble substances pass through protein pores in membranes.
3. Smaller molecules in solution are forced through membranes by pressure while larger molecules remain behind.
4. Ions such as Na^+ are moved from regions of lower concentration inside a cell to regions of higher concentration outside the cell.

3. The characteristic of cell membranes that determines these functions is
- A. selective permeability
 - B. active transport
 - C. diffusion
 - D. filtration
-
4. Which cellular process could maintain an **unequal** concentration of ions inside and outside a cell?
- A. Osmosis
 - B. Diffusion
 - C. Phagocytosis
 - D. Active transport
5. In normal growth processes, special bone-destroying cells called osteoclasts absorb bone by endocytosis and secrete enzymes that dissolve the ingested bone. To perform these processes, osteoclasts contain large numbers of
- A. lysosomes and ribosomes
 - B. mitochondria and vacuoles
 - C. Golgi complexes and centrioles
 - D. ribosomes and mineral inclusions

Use the following diagram to answer questions 6 and 7.



6. Which processes can account for the change in the concentration of glucose molecules outside and inside the cell at time = 1 h?
- A. Osmosis into the cell and excretion out of the cell
 - B. Diffusion into the cell and excretion out of the cell
 - C. Osmosis into the cell and respiration within the cell
 - D. Diffusion into the cell and respiration within the cell
7. What would have happened to the distribution of glucose molecules if this cell had died at time = 0 h and the permeability of the membrane had remained unchanged?
- A. There would have been no movement of glucose molecules into or out of the cell.
 - B. There would have been greater movement of glucose molecules out of the cell than into the cell.
 - C. Eventually the concentration of glucose molecules would have become greater inside the cell than outside the cell.
 - D. Eventually the concentration of glucose molecules would have become equal inside the cell and outside the cell.

Use the following information to answer question 8.

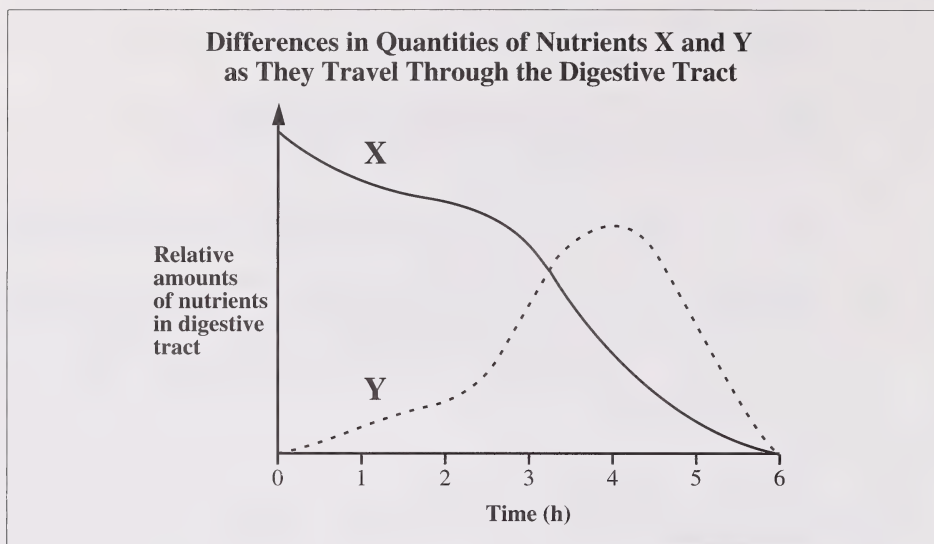
Examples of Structures That Facilitate Body Functions

- The mucosa of the small intestine contains many villi.
- A skeletal muscle contains many capillary beds.
- A lung is composed of many alveoli.
- A kidney is composed of many nephrons.

8. What can be inferred from these examples?
- A. Osmosis is based on water pressure.
 - B. Increased surface area increases efficiency.
 - C. Diffusion is based on concentration gradients.
 - D. Active transport is directly related to energy reserves.
-
9. In an enzymatically controlled reaction, which substance is chemically altered by the action of an enzyme?
- A. Product
 - B. Inhibitor
 - C. Substrate
 - D. Coenzyme
10. A small increase in body temperature usually increases the rate of enzymatically controlled reactions. However, a large increase in body temperature is dangerous in humans because
- A. heat will cause a change in the type of products produced by enzymes
 - B. most of the available energy will be used up in chemical reactions
 - C. enzymes will work too rapidly and produce excess products
 - D. enzyme function will slow as proteins are denatured

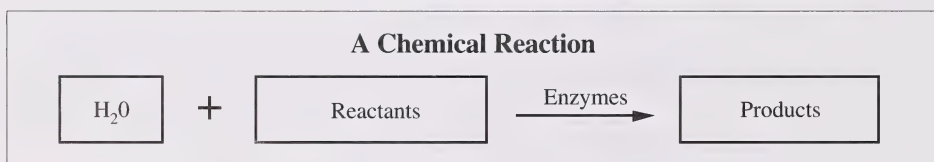
11. Which description is an example of negative feedback?
- A. A sailor, lost at sea, drinks sea water to quench his thirst. This causes his thirst to increase and his urinary output to decrease.
 - B. High concentrations of glucose in the blood promote insulin release. This causes blood glucose levels to decrease, thus decreasing insulin release.
 - C. At the beginning of a nerve impulse, a small inward flow of Na^+ into a neuron promotes a large inward flow of Na^+ . The polarity of the membrane decreases.
 - D. Injured brain tissue swells causing increased pressure inside the skull and decreased oxygen supply, which in turn promotes more swelling. The victim usually dies.
12. Intestinal villi function to
- A. secrete lipids into adjacent capillaries
 - B. actively transport water
 - C. absorb nutrients
 - D. assist peristalsis
13. Which liver function is most closely associated with metabolism of protein-rich food?
- A. Storage of fat-soluble vitamins
 - B. Production of urea during the process of deamination
 - C. Production of cholesterol, which is released into the blood
 - D. Secretion of bile, which is temporarily stored in the gallbladder and then released into the duodenum
14. Substances that are **not** digested by enzymes in the human digestive tract include
- A. amino acids, polypeptides, and disaccharides
 - B. cellulose, amino acids, and monosaccharides
 - C. glucose, vitamins, and disaccharides
 - D. vitamins, glycerol, and starch

Use the following graph to answer question 15.



15. If nutrients were ingested only at time = 0 h, then line X and line Y could represent, respectively,
- starch and glucose
 - maltose and glycogen
 - glycerol and fatty acids
 - amino acids and proteins

Use the following diagram to answer question 16.



16. If the reactants are proteins, then the products are
- amino acids
 - nucleic acids
 - simple sugars
 - fatty acids and glycerol

Use the following information to answer question 17.

A student tested each of four mixtures for the presence of starch, lipids, and proteins, and then recorded the results in a table.				
Test	Mixture			
	I	II	III	IV
Biuret	blue	violet	violet	violet
Iodine	blue-black	yellow-brown	blue-black	yellow-brown
Sudan IV	no color change	no color change	no color change	red
Translucence	no	no	no	yes

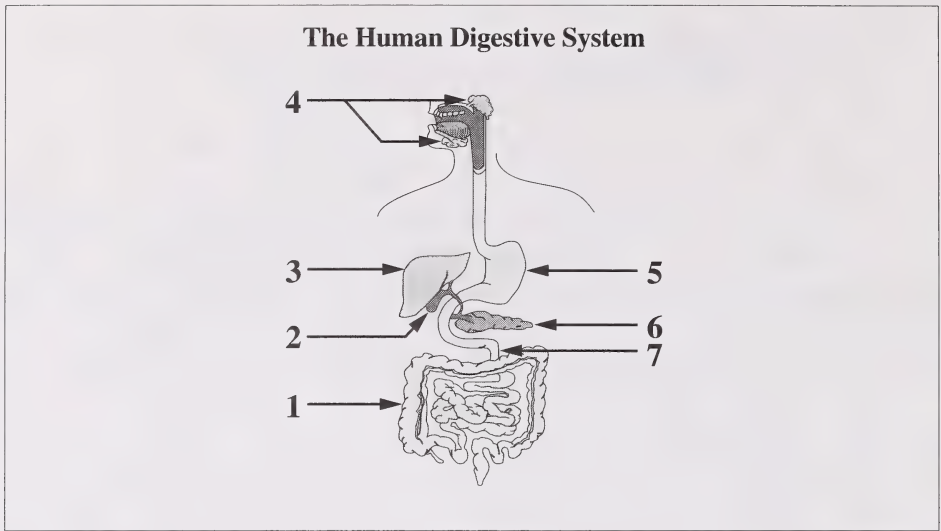
17. Which of the mixtures contain(s) starch?

- A. I only
 - B. I and III
 - C. II and IV
 - D. IV only
- _____

18. Humans ingest considerable quantities of plant starch. However, a starch test applied to blood plasma yields a negative result. Which **row** provides two reasons for this negative result?

Row	Reason 1	Reason 2
A	Starch is denatured in the stomach.	Starch molecules must be actively transported across cell membranes.
B	Starch is deaminated in the liver.	Starch molecules are insoluble in blood plasma.
C	Starch molecules are digested in blood plasma.	Starch is made up of glucose units.
D	Starch is broken down in the digestive system.	Starch molecules are too large to diffuse into capillaries.

Use the following diagram to answer question 19.



19. Which **row** identifies structures that facilitate chemical digestion of carbohydrates and structures that help to regulate blood-glucose levels?

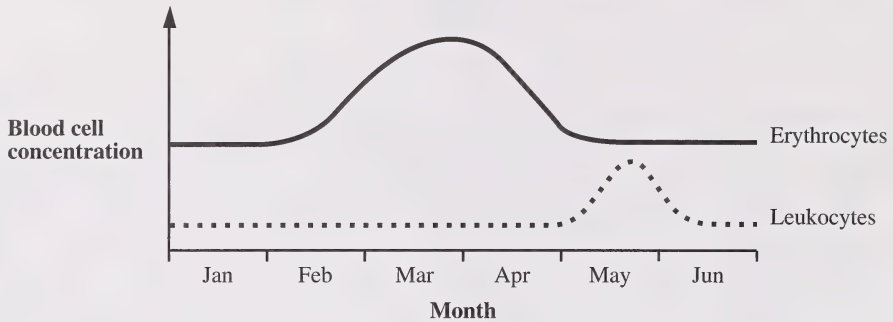
Row	Structures that Facilitate Chemical Digestion of Carbohydrates	Structures that Help to Regulate Blood-glucose Levels
A	1 and 6	3 and 7
B	4 and 6	3 and 6
C	4 and 7	2 and 3
D	5 and 7	4 and 6

20. The human digestive system secretes a greater variety of protein-digesting enzymes than either carbohydrate-digesting enzymes or lipid-digesting enzymes. The reason for this difference is that
- A. proteins are structurally more complex than are carbohydrates or lipids
 - B. proteins are more abundant in human diets than are carbohydrates or lipids
 - C. proteins are more important in human diets than are carbohydrates or lipids
 - D. proteins are absorbed more quickly in the digestive tract than are carbohydrates or lipids

21. The circulatory system assists the functioning of the digestive system by transporting
- A. HCl to the stomach
 - B. bile to the duodenum
 - C. enzymes to digestive organs
 - D. hormones to digestive organs
22. Which substance is **least** likely to be found in human lymph?
- A. Lipid
 - B. Water
 - C. Protein
 - D. Hemoglobin
23. The maintenance of a body tissue is similar to the maintenance of a household in that both must have ways of obtaining nutrients and disposing of wastes. In a tissue, these needs are satisfied mainly through the function of
- A. capillaries
 - B. arterioles
 - C. arteries
 - D. veins
24. The function of carotid stretch receptors is to
- A. monitor blood pressure
 - B. keep the heart rate constant
 - C. offset a blood oxygen concentration that is too high
 - D. offset a blood carbon dioxide concentration that is too high
25. At its carrier sites, a hemoglobin molecule can combine with
- A. oxygen and carbon dioxide only
 - B. oxygen and carbon monoxide only
 - C. oxygen, carbon dioxide, and nitrogen
 - D. oxygen, carbon dioxide, and carbon monoxide

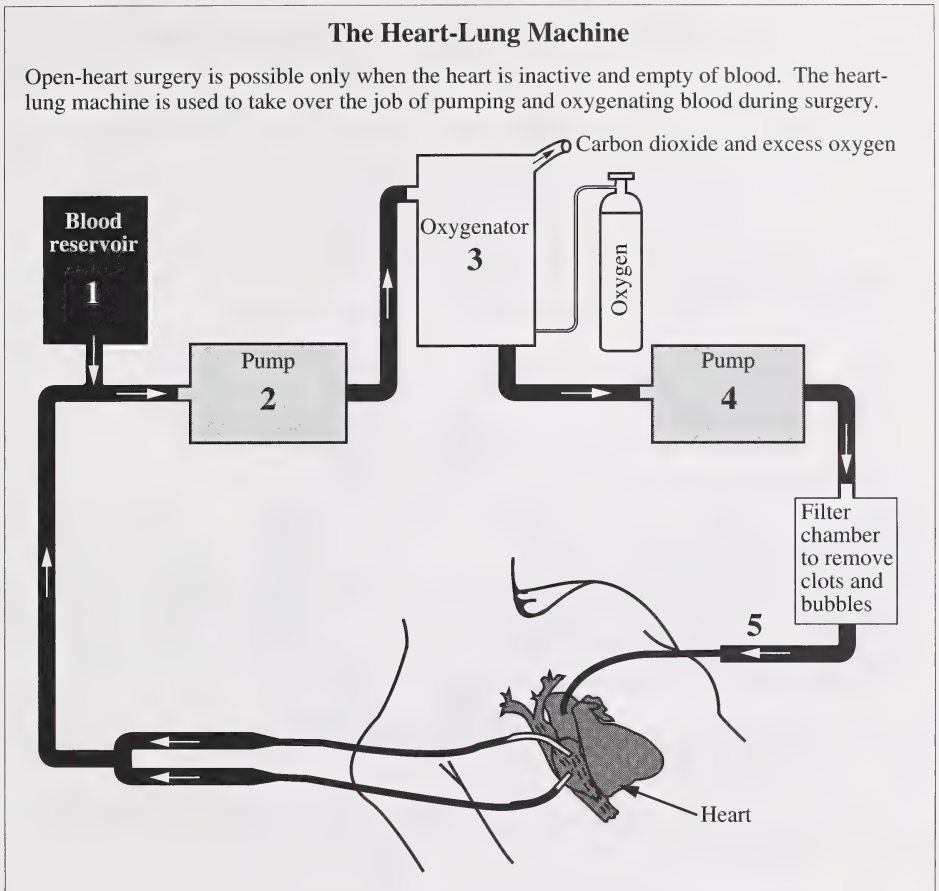
Use the following information to answer question 26.

The graph indicates the concentration of erythrocytes and leukocytes in the blood of an individual during the time period from January to June.



26. Assuming this individual's home was at sea level, which hypothesis **best** explains the increase and subsequent decrease of each curve?
- A. The individual was skiing in the mountains for a weekend in March and acquired a bacterial infection in April.
 - B. The individual suffered from a bleeding ulcer from February to April, which was corrected by surgery in May.
 - C. The individual was skiing in the mountains during February and March, returned home in April, and contracted a bacterial infection in May.
 - D. The individual developed a massive bacterial infection in February, recovered by April, and then took a hiking trip to the mountains in May.
-
27. When a person quickly moves from a lying position to a standing position, fainting may occur because of lack of blood in the brain. To deliver more blood to the brain, the body responds by
- A. decreasing the heart rate and dilating arterioles in the brain
 - B. decreasing the heart rate and constricting arterioles in the brain
 - C. increasing the heart rate and dilating arterioles in the arms and legs
 - D. increasing the heart rate and constricting arterioles in the arms and legs

Use the following information to answer questions 28 and 29.



28. Which part of the heart-lung machine functions like the right ventricle of the heart?
- A. 1
 - B. 2
 - C. 3
 - D. 4
29. The tube labelled 5 is most likely carrying blood to the
- A. aorta
 - B. pulmonary artery
 - C. inferior vena cava
 - D. superior vena cava

Use the following information to answer question 30.

**Events Occurring During Contraction of the Heart,
Arranged in Random Order**

1. Atrio-ventricular valves open completely
2. Semi-lunar valves open completely
3. Atrio-ventricular valves close
4. Atrial contraction begins
5. Ventricular contraction begins

30. Which sequence is correct?

- A.** 2, 4, 3, 1, and 5
 - B.** 4, 1, 5, 3, and 2
 - C.** 4, 5, 1, 2, and 3
 - D.** 5, 3, 4, 1, and 2
-

31. Injection of a histamine into the blood causes capillary permeability to increase, allowing plasma proteins to leak into the tissues. As a result, there is a shift in osmotic pressure which causes fluid to diffuse from the blood into the tissues. In time, the lymph system will reduce this tissue swelling by

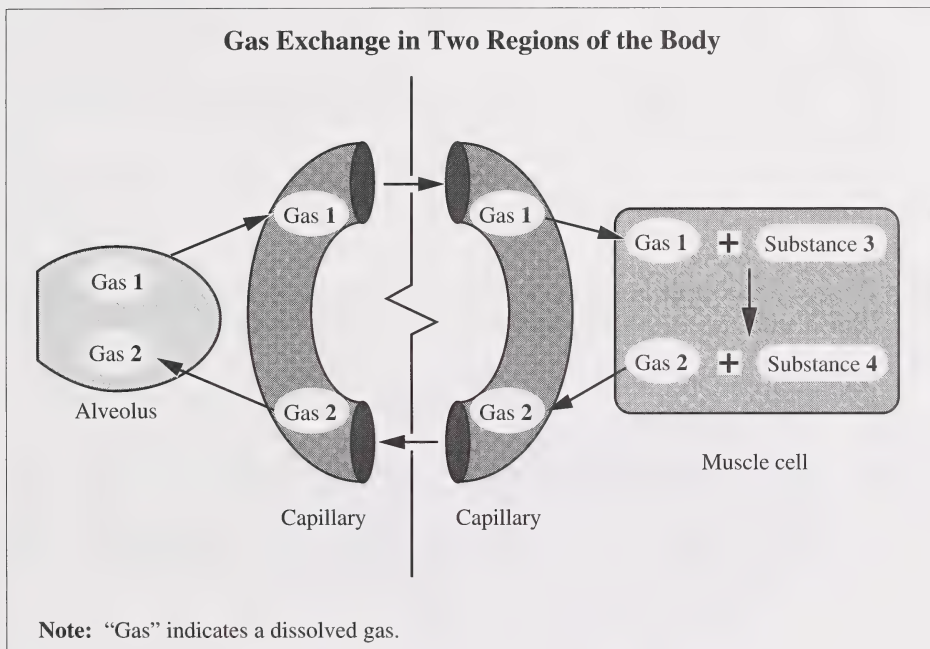
- A.** storing excess fluid in the lymph nodes until it can be released through the sweat glands
- B.** removing the plasma proteins and fluid from the tissue and returning them to the blood
- C.** transporting excess fluid directly to the kidneys
- D.** decreasing the size of capillary pores

32. Blood leaving the capillaries surrounding alveoli is

- A.** oxygenated in both the left and right lung
- B.** deoxygenated in both the left and right lung
- C.** oxygenated in the left lung and deoxygenated in the right lung
- D.** deoxygenated in the left lung and oxygenated in the right lung

33. During deep inhalation, the diaphragm contracts and the external intercostal muscles
- relax, allowing the ribs to move up and out
 - relax, allowing the ribs to move down and in
 - contract, causing the ribs to move up and out
 - contract, causing the ribs to move down and in

Use the following information to answer question 34.



34. Which **row** identifies the gases and substances in the diagram?

Row	Gas 1	Gas 2	Substance 3	Substance 4
A	oxygen	carbon dioxide	glucose	water
B	oxygen	carbon dioxide	water	glucose
C	carbon dioxide	oxygen	glucose	water
D	carbon dioxide	oxygen	water	glucose

Use the following information to answer question 35.

Events Related to Breathing, Arranged in Random Order

1. Nervous stimulation of the diaphragm
2. Decreased concentration of CO_2 in the blood
3. Chemical stimulation of the respiratory centre
4. Increased concentration of CO_2 in the blood
5. Increased rate of breathing

35. The sequence of events which occurs as the breathing rate is increased is
- A. 2, 4, 3, 1, and 5
 - B. 3, 4, 5, 1, and 2
 - C. 4, 1, 2, 5, and 3
 - D. 4, 3, 1, 5, and 2
-
36. Glucose and oxygen are reactants needed for the process of aerobic cellular respiration. Which other substances are required for this process to begin?
- A. Enzymes and ADP
 - B. Lactic acid and water
 - C. Vitamins and carbon dioxide
 - D. Lactic acid and carbon dioxide

Use the following information to answer question 37.

Equal volumes of live human cells were placed in four flasks labelled 1, 2, 3, and 4. Each flask contained some nutrients and was incubated at the temperature shown.

Flask	Water (L)	Glucose (g)	Dissolved Oxygen (g/L of Solution)	Temperature (°C)
1	1	3	0.00	37
2	1	3	0.03	30
3	1	3	0.00	30
4	1	3	0.03	37

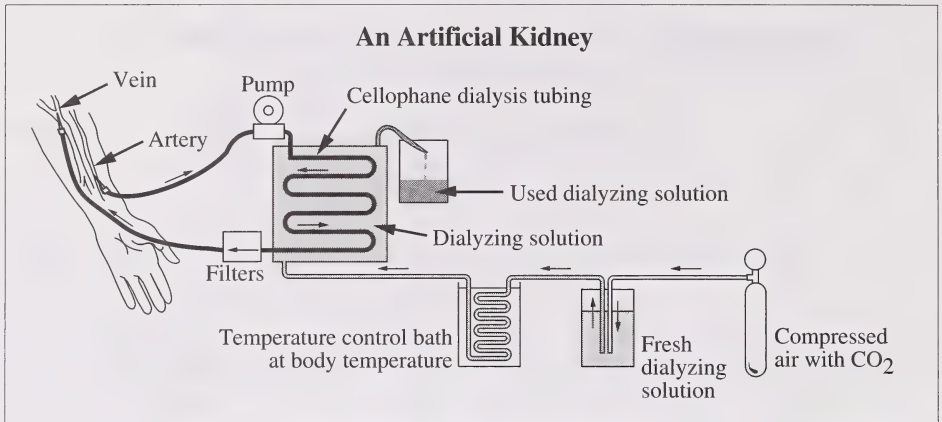
37. In which flask will the cells produce the greatest amount of lactic acid?

- A. 1
 - B. 2
 - C. 3
 - D. 4
-

38. A high level of aldosterone in the kidneys will cause

- A. increased reabsorption of sodium ions and increased urine production
- B. increased reabsorption of sodium ions and decreased urine production
- C. decreased reabsorption of sodium ions and increased urine production
- D. decreased reabsorption of sodium ions and decreased urine production

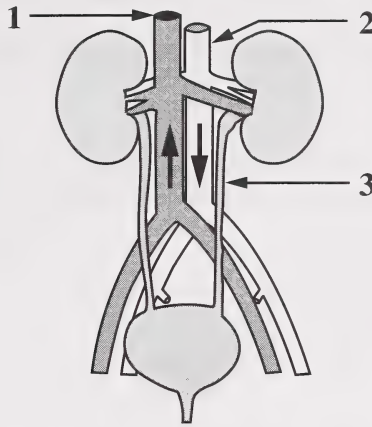
Use the following diagram to answer questions 39 and 40.



39. An artificial kidney removes nitrogenous wastes from blood by
- A. active transport
 - B. endocytosis
 - C. diffusion
 - D. osmosis
40. Which statement about an artificial kidney is **false**?
- A. Used dialyzing solution contains urea.
 - B. Arterial blood entering the artificial kidney contains urea.
 - C. Fresh dialyzing solution has a lower urea concentration than normal blood plasma has.
 - D. Arterial blood entering the artificial kidney has a lower urea concentration than the dialyzing fluid has.
-
41. Antidiuretic hormone (vasopressin) directly regulates the volume of urine production by changing the
- A. amount of nephric filtrate
 - B. glomerular blood pressure
 - C. permeability of collecting tubules
 - D. materials involved in tubular secretion

Use the following information to answer question 42.

Anatomy of the Human Excretory System



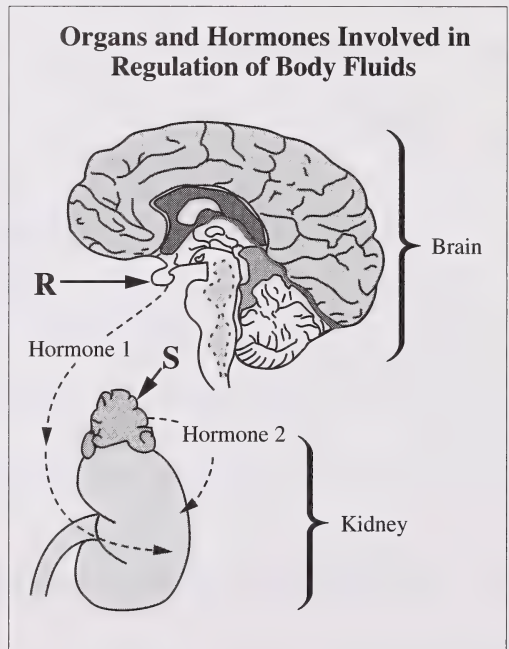
42. Which **row** correctly describes the fluid contained in each labelled structure?

Row	Structure 1	Structure 2	Structure 3
A	relatively high levels of CO ₂	relatively high levels of O ₂	relatively low levels of urea
B	relatively low levels of CO ₂	relatively high levels of O ₂	uric acid absent
C	relatively high levels of CO ₂	erythrocytes present	uric acid present
D	relatively low levels of CO ₂	leukocytes present	relatively high levels of urea

43. An individual with sugar diabetes **initially** has a problem with the utilization of

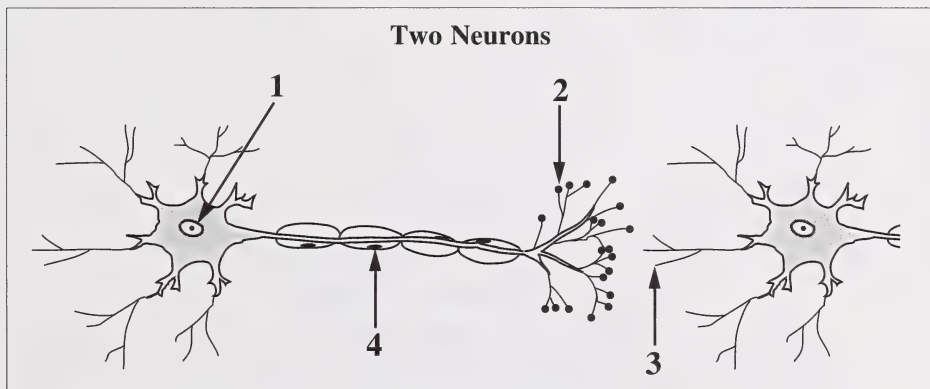
- A. fats
- B. proteins
- C. nucleic acids
- D. carbohydrates

44. Most people with sugar diabetes take insulin by injection rather than by mouth. This is because insulin is a
- protein and inhibits digestive enzymes in the stomach
 - protein and is digested by enzymes to form amino acids
 - polysaccharide and must be quickly delivered to the liver
 - polysaccharide and inhibits sugar digestion in the small intestine
45. Rapid weight gain, tiredness, and puffy skin in humans may be caused by
- increased LH secretion
 - increased insulin secretion
 - decreased glucagon secretion
 - decreased thyroxine secretion
46. In the diagram at the right, the organs labelled R and S are part of the
- exocrine system and are, respectively, the pituitary and the pancreas
 - endocrine system and are, respectively, the pituitary and the adrenal gland
 - endocrine system and are, respectively, the hypothalamus and the pancreas
 - exocrine system and are, respectively, the hypothalamus and the adrenal gland



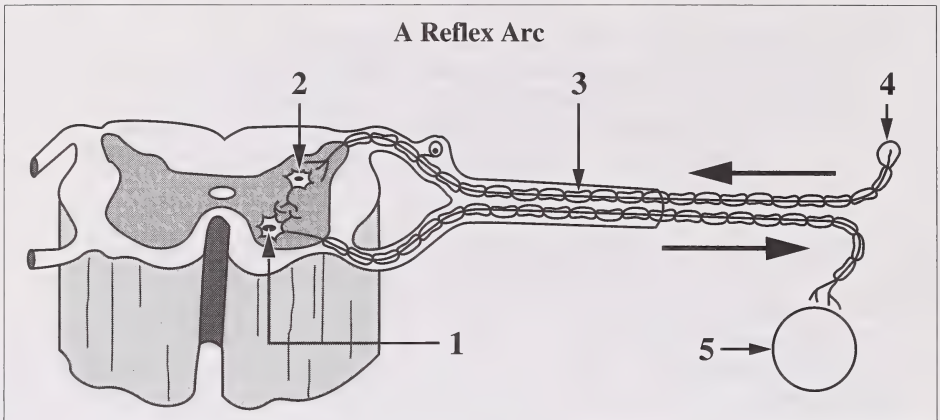
47. Following an emergency, which response helps bring the body back to a relaxed state?
- A. Increasing the output of adrenaline (epinephrine)
 - B. Decreasing the output of adrenaline (epinephrine)
 - C. Increasing the activity of the sympathetic nervous system
 - D. Decreasing the activity of the parasympathetic nervous system
48. Which structure equalizes air pressure between the outer and middle ear?
- A. Eustachian tube
 - B. Round window
 - C. Oval window
 - D. Ossicle

Use the following diagram to answer question 49.



49. Acetylcholine is released from the structure labelled
- A. 1
 - B. 2
 - C. 3
 - D. 4

Use the following diagram to answer question 50.



50. A receptor, an interneuron, and an effector are labelled **respectively**

- A. 1, 2, and 5
- B. 3, 4, and 1
- C. 3, 5, and 1
- D. 4, 2, and 5

Use the following information to answer question 51.

Alzheimer's Disease

Alzheimer's disease results in loss of memory, a change in personality, and the eventual deterioration of a person's mental abilities. People with Alzheimer's disease develop unusual deposits of beta-amyloid protein in their brains. Because brain tissue can be safely studied only after death has occurred, scientists are not sure whether these deposits cause the disease or develop as a result of the disease.

51. If beta-amyloid protein tends to be deposited inside axons, the changes in the affected individual would likely result from

- A. the secretion of more acetylcholine
- B. an increase in the thickness of the myelin sheath
- C. the blockage of normal nerve impulse transmission
- D. a decrease in the amount of cholinesterase released

Use the following information to answer question 52.

Factors that Could Affect Neuromuscular Junctions

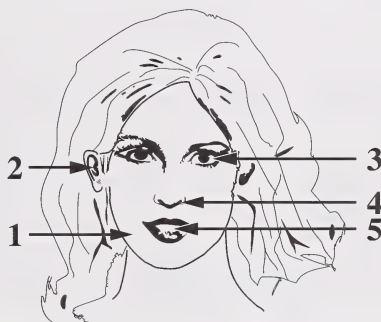
- I. Increase in the production of adrenaline
- II. Inhibition of cholinesterase synthesis
- III. Inhibition of acetylcholine release
- IV. Blockage of receptor sites for acetylcholine in the muscle

52. Identify **all** of the factors that would cause muscles used in breathing to lose their ability to function.

- A. I and II
 - B. I, III, and IV
 - C. II and III
 - D. II, III, and IV
-

Use the following diagram to answer question 53.

Receptor Areas of the Head



53. Chemoreceptors are depolarized as stimuli arrive by routes

- A. 1 and 2
- B. 2 and 3
- C. 3 and 4
- D. 4 and 5

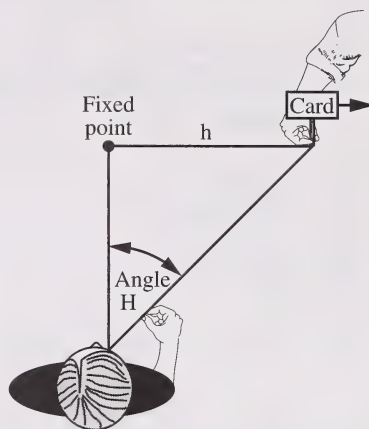
Use the following information to answer questions 54 and 55.

Determination of the Positions of Light Receptors in the Eye

A subject was asked to stare at a fixed point on a wall. An investigator held a card in front of the subject and slowly moved the card sideways in the subject's field of vision. The subject was asked to indicate when the color of the card could no longer be distinguished. Distance "h" was measured and used to determine angle H, the angle at which the color could no longer be distinguished. Several different colors of cards were used. Four subjects participated in the investigation. The following data were recorded.

Angles (degrees) at Which Colors Could Not Be Distinguished by Test Subjects

Subject	Primary Colors			Other Colors	
	Red	Blue	Green	Black	White
1	76	79	69	81	84
2	77	78	68	84	83
3	73	77	70	84	85
4	74	76	70	83	84



54. The data indicate that

- A. receptors for red light are located nearer to the centre of the retina than are receptors for green light
- B. receptors for blue light are located nearer to the centre of the retina than are receptors for red light
- C. receptors for blue light are more numerous on the periphery of the retina than are receptors for green light
- D. receptors for green light are more numerous on the periphery of the retina than are receptors for red light

55. Based on the information, which conclusion is **not** logical?

- A. Black and white images are visible in your peripheral vision.
- B. Black and white images are visible when viewing objects directly in front of you.
- C. Perception of primary colors is best when viewing objects directly in front of you.
- D. Perception of primary colors is best when viewing objects in your peripheral vision.

56. The eyes of birds contain structures that perform the same functions as structures found in human eyes. Owls are active at night. Sparrows are active in daylight. A hypothetical explanation for the behavioural differences of owls and sparrows, which could be tested by dissection and microscopic observation, is that the
- A. retinas of owls possess only rods
 - B. pupils of sparrows do not dilate in dim light
 - C. corneas of owls act as accessory focusing structures
 - D. lenses of sparrows can focus only in brightly lit conditions
57. The function of tendons is to
- A. connect bone to bone
 - B. attach muscle to bone
 - C. connect bone to ligaments
 - D. attach muscle to ligaments

Use the following information to answer question 58.

Stimulation of Muscle Fibres

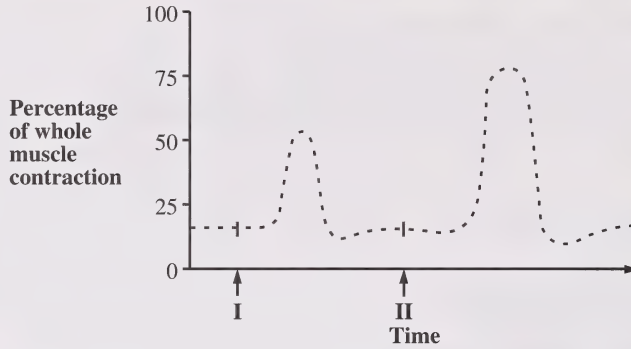
In an experiment, two muscle fibres were electrically stimulated and their responses were noted. Stimulation began at a strength of 5 mV and was gradually increased to 50 mV. Muscle fibre 1 was found to have a threshold stimulus of 18 mV. Muscle fibre 2 was found to have a threshold stimulus of 32 mV.

58. Which **row** in the chart shows two observations likely recorded during the experiment?

Row	Stimulus Voltage	Response of Muscle Fibre 1	Response of Muscle Fibre 2
A	15 mV	relaxed	contracted
B	25 mV	contracted	relaxed
C	35 mV	contracted	relaxed
D	45 mV	relaxed	relaxed

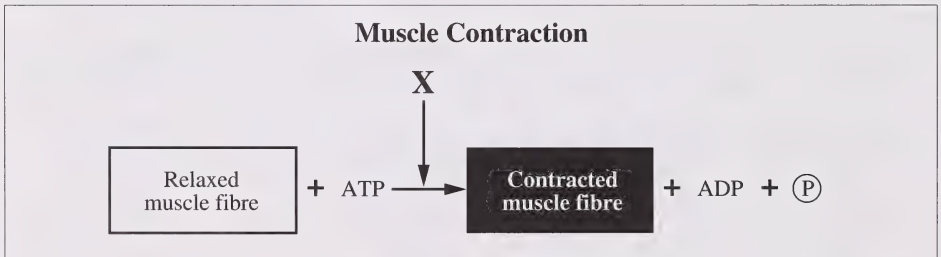
Use the following information to answer question 59.

Two electrical stimuli were applied to a **whole muscle**, the biceps. The stimulus applied at time **I** was of lower intensity than the stimulus applied at time **II**. The degree of muscle contraction was graphed.



59. A correct inference from the graph is that
- A. after stimulation, a rest period increases the degree of whole muscle contraction
 - B. the degree of whole muscle contraction is determined by the stimulus strength
 - C. unstimulated whole muscle has no degree of contraction
 - D. whole muscle contraction is an all-or-none response

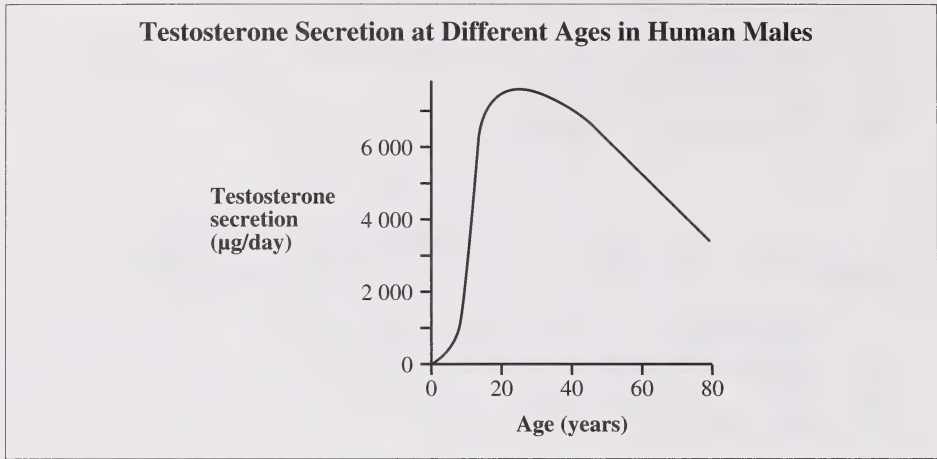
Use the following information to answer question 60.



60. What does X represent?
- A. Myosin filaments
 - B. Actin filaments
 - C. Calcium ions
 - D. Oxygen gas

61. The most common sites for fertilization and implantation, **respectively**, are the
- A. uterus and vagina
 - B. endometrium and uterus
 - C. vagina and Fallopian tubes
 - D. Fallopian tubes and endometrium
62. The hormones from the pituitary that influence the secretion of hormones from the ovaries are
- A. FSH and LH
 - B. estrogen and FSH
 - C. FSH and progesterone
 - D. estrogen and progesterone
63. One structural feature of a human sperm that enables it to move toward an egg is a
- A. large number of mitochondria
 - B. membrane impermeable to urea
 - C. membrane sensitive to a high pH
 - D. cytoplasm containing a large quantity of sugar

Use the following graph to answer question 64.



64. The change in testosterone levels in males between the ages of 13 and 18 can be accounted for by
- A. increased production of gonadotropic hormones by the pituitary
 - B. decreased production of gonadotropic hormones by the pituitary
 - C. decreased stimulation of the reproductive system by the sympathetic nervous system
 - D. increased stimulation of the reproductive system by the parasympathetic nervous system
-
65. The vasa deferentia in a male became blocked by an infection which was confined to these tubes. A likely result was that his
- A. male secondary sex characteristics degenerated
 - B. testosterone production decreased
 - C. sperm could not reach the urethra
 - D. sperm production stopped

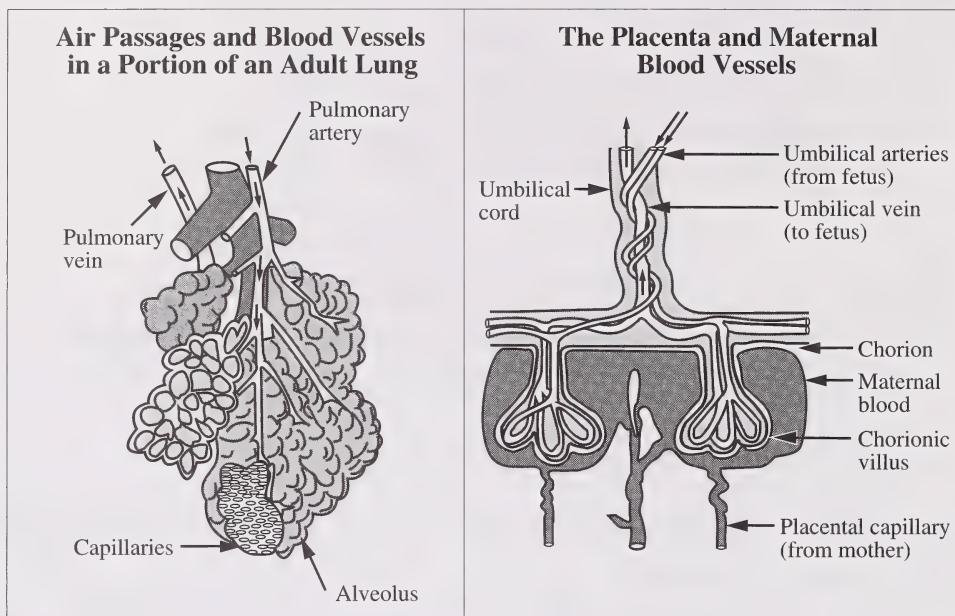
66. Toward the end of the menstrual (ovarian) cycle, retention of the thickened endometrium of the uterus depends upon the
- increase of gonadotropin production by the ovaries
 - decrease of gonadotropin production by the ovaries
 - egg being fertilized and the progesterone level decreasing
 - egg being fertilized and the progesterone level remaining high

Use the following information to answer question 67.

Rates of Hormone Secretion at Different Stages of Pregnancy						
Gland	Hormone	8 weeks	16 weeks	24 weeks	32 weeks	40 weeks
Placenta	human chorionic gonadotropin (International Units/mL of blood)	60	12	5	3	2
Placenta	progesterone (mg/24 h)	22	50	125	250	235
Placenta	estrogen (mg/24 h)	1	3	8	16	20
Ovary	progesterone (mg/24 h)	25	trace	trace	trace	trace
Ovary	estrogen (mg/24 h)	1	trace	trace	trace	trace

67. The level of human chorionic gonadotropin changes significantly after eight weeks because the
- embryo increases in size
 - follicle and the corpus luteum increase in size
 - placenta secretes sufficient quantities of progesterone and estrogen
 - ovaries secrete insufficient quantities of progesterone and estrogen
-
68. A blood sample was taken from a pregnant woman at the onset of labor and the birth process. Compared to a blood sample taken one week earlier, analysis of this new blood sample would show increased amounts of which hormones?
- Relaxin and oxytocin
 - Relaxin and progesterone
 - Estrogen and progesterone
 - Oxytocin and progesterone

Use the following diagrams to answer questions 69 and 70.



69. Which part of the placenta has a function similar to an alveolus in the lung?
- A. Placental capillary
 - B. Chorionic villus
 - C. Maternal blood
 - D. Umbilical cord
70. The structures that contain blood with a high concentration of CO_2 are the
- A. pulmonary vein and the umbilical vein
 - B. pulmonary vein and the umbilical arteries
 - C. pulmonary artery and the umbilical vein
 - D. pulmonary artery and the umbilical arteries

You have now completed Part A. Proceed directly to Part B.

Part B: Written Response

4 Questions

Instructions

- Read each question carefully.
- Write your answers in the examination booklet as neatly as possible.
- Communicate your answers in clear, complete sentences unless the response format dictates otherwise. Marks will be awarded for pertinent explanations and answers. Question 1 has three marks allotted for written communication skills.

Note: The perforated pages at the back of this booklet may be torn out and used for your rough work. ***No marks*** will be given for work done on the tear-out pages.

Start Part B immediately.

Total: 10 marks

Use the following information to answer question 1.

Cystic Fibrosis

Cystic fibrosis is a genetic disease that occurs approximately once in every 2 500 births. This disease causes several exocrine glands (glands with ducts), including the pancreas, liver, and sweat glands, to function abnormally. People with the disease produce large quantities of extremely thick and sticky mucus in the respiratory (breathing) system and digestive tract. Another effect of the disease is the overproduction of sweat containing high concentrations of sodium chloride (salt). With regular treatment, children born with cystic fibrosis can live fairly normal lives.

1. Describe **three** physiological problems associated with breathing, digestion, or other body functions that a person with cystic fibrosis might encounter because of abnormal functioning of exocrine glands. Identify the cause of each problem and its effect on a specific body function. (5 marks)

Describe **two** treatments (technologies) that would help a person with cystic fibrosis to live a more normal life. (2 marks)

Communicate your response in paragraphs that are clearly written and logically organized. Diagrams may be used to enhance your descriptions. (3 marks)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

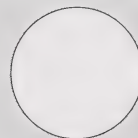
.....

U.S. GPO

CONC

TECH

COMM



Total: 10 marks

Use the following information to answer question 2.

The Cold Buster

Some researchers have been investigating the problem of hypothermia in humans, especially those involved in outdoor activities. It has long been known that during exposure to cold, hypothermia occurs when heat loss exceeds heat production in the body.

Using studies of rats, researchers have discovered that certain special nutrient mixtures or compounds such as aminophylline or theophylline may stimulate body heat production. Dr. L. Wang, a University of Alberta zoologist, designed an experiment to test body heat production using five groups of rats. The rats were left in comfortable cages overnight with water but no food. In the morning, four groups of rats were treated experimentally and then all five groups were placed in a cold room (-10°C) for two hours. The body heat production of the rats was monitored at 15-minute intervals.

Some of the treatments and average results of this study are summarized in the following table.

Study 1: Body Heat Production in Rats

Group	Experimental Treatment Given	Average Rate of Heat Production (kJ/15 min)
I	none	5.2
II	aminophylline injected	6.0
III	fed special nutrient mixture and aminophylline injected	7.1
IV	*	6.3
V	*	6.9

*Note: Some information has been purposely omitted from the table.

(2 marks)

2. a. When study 1 was designed, all variables affecting the five groups were identical (fixed) except for the treatment given. Identify two of these fixed variables related to the environment of the rats.

.....

.....

.....

.....

.....

Continued

- b. Identify the group that acted as a control in study 1. Explain why this group acted as a control.

(1 mark)

.....

.....

.....

.....

- c. The experimental treatments given groups IV and V in study 1 are not shown in the table on page 32. Based on the data, suggest what the treatment might have been for one of these two groups.

(1 mark)

.....

.....

.....

Dr. Wang conducted another study to investigate body heat production, this time using human subjects. One group of subjects ate a placebo food that tasted like normal food but had no nutritional value. A second group ate the placebo food and a special nutrient mixture. A third group ingested the substance theophylline. The fourth group ingested theophylline and the same special nutrient mixture. The subjects, healthy males dressed in shorts, were then exposed to a temperature of -10°C for three hours. Their body temperatures were monitored throughout the study. The final results are summarized in the following table.

Study 2: Body Temperature Decrease in Humans After Exposure to Cold

Group	Experimental Treatment Given	Decrease in Body Temperature ($^{\circ}\text{C}$)
I	placebo food	0.9
II	placebo food and the special nutrient mixture	0.7
III	theophylline	0.6
IV	theophylline and the special nutrient mixture	0.4

This research and other studies eventually led to the development of the Canadian Cold Buster™ snack bar, which contains chiefly natural food ingredients. The bar was originally developed for use by the men and women of the Canadian Armed Forces.

Continued

(1 mark)

- d. To ensure valid results for study 2, the researchers controlled many factors during the time the subjects were exposed to the cold. Identify one of these factors.

.....

.....

.....

(2 marks)

- e. State two conclusions supported by the data from study 1 and/or study 2.

.....

.....

.....

.....

.....

(2 marks)

- f. Describe two possible physiological effects of the special nutrient mixture that might cause an increase in body heat production.

.....

.....

.....

.....

.....

.....

(1 mark)

- g. Suggest one reason, other than an increase in body heat production, that the Canadian Armed Forces would be interested in the development of the Canadian Cold Buster™ snack bar.

.....

.....

.....



Use the following information to answer question 3.

Total: 5 marks

A Unique Treatment for High Blood Pressure

High blood pressure, or hypertension, affects millions of Canadians. In ninety per cent of these individuals, the cause is unknown. Dr. Peter Janetta, a neurosurgeon, has a novel approach to treating high blood pressure. He believes the cause is an artery pulsing against the left side of the medulla oblongata and disrupting its normal blood pressure control function.

To treat high blood pressure Dr. Janetta performs surgery which involves exposing the patient's brain and examining the arteries next to the medulla oblongata. If an artery is found to be pressing on the medulla, the artery is elevated and cushioned so that the medulla is not compressed. Of 42 patients on whom this surgery was performed, 32 were able to significantly reduce or stop their medication for high blood pressure.

- 3. a.** Identify two possible causes of hypertension other than the one proposed by Dr. Janetta.

(2 marks)

.....

.....

.....

.....

- b.** Explain how an artery pulsing against the medulla oblongata could cause hypertension.

(2 marks)

.....

.....

.....

.....

- c.** Does Dr. Janetta's discovery replace our current ideas about the causes of high blood pressure? Explain.

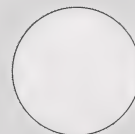
(1 mark)

.....

.....

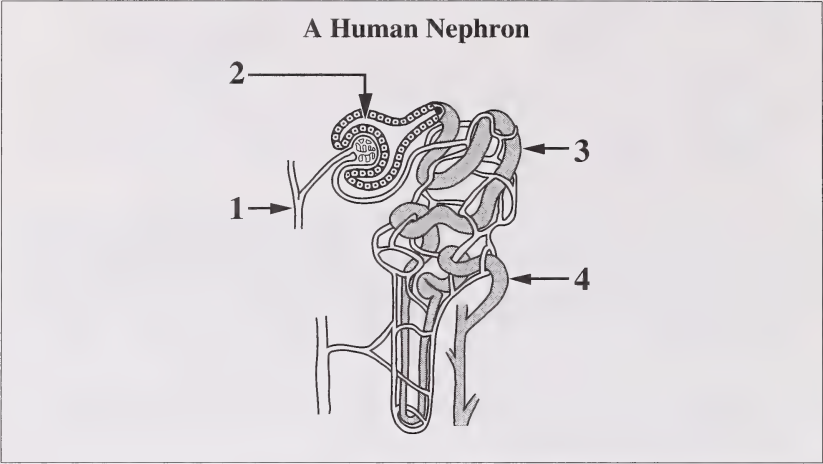
.....

.....



Total: 5 marks

Use the following diagram to answer question 4.



(2 marks)

4. a. Name a component present in the fluid within structure **1** but **not** in the fluid within structure **2**. Explain why the component is not present in the fluid within structure **2**.

.....

.....

.....

.....

.....

(2 marks)

- b. Name a component present in the fluid within structure **3** but **not** in the fluid within structure **4**. Explain why the component is not present in the fluid within structure **4**.

.....

.....

.....

.....

.....

(1 mark)

- c. Explain why a component could be present in the fluid within structure 4 but **not** in the fluid within structure 3.

.....

.....

.....

.....



*You have now completed the examination.
If you have time, you may wish to check your answers.*

No marks will be given for work done on this page.

No marks will be given for work done on this page.

No marks will be given for work done on this page.

Name

Apply Label With Student's Name

Biology 30

Name: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>																				(Last Name)										(Legal First Name)										<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>																																								Date of Birth:										Sex:									
										Y										M										D																																																																					

No Name

Apply Label Without Student's Name

Biology 30



For Department Use Only

M1	
M2	
M3	
M4	